PROF. MELDE of Marburg proposes to study the force of electric reaction as exhibited in the rotation of Hamilton's well-known "mill," by attaching the "mill" to a torsion fibre, and observing the *torque* produced by the electric reaction. As Tomlinson has shown, the "mill" will work when surrounded by turpentine or other insulating liquid; hence Prof. Melde's suggestion promises to prove of some interest.

DR. H. P. BOWDITCH has recently published in the *Journal of Physiology* a paper on the optical illusions of motion, in which he deals chiefly with the peculiar illusions of rotation, &c., studied a few years ago by Prof. Silvanus P. Thompson. He entirely agrees with the latter experimenter in rejecting the explanation advanced by R. Addams, and more recently by Javal, that these illusions are due to muscular slip, and declares that such an explanation is worthless, being contradicted by the fact that motor after-effects in opposite directions are possible for the same retina at the same time. Dr. Bowditch also thinks that these persistent after-impressions of motion cannot be the product of experience or association, because experience cannot overcome, nor volition control or reverse them. He looks for an explanation in the narrowness of the limits of distinct vision.

M. BERSON has contributed to our knowledge of the magnetic properties of metals by some recent researches on their degree of magnetisation at different temperatures. The experimental method followed consisted in comparing the magnetic moments of different bars by Gauss's method at different temperatures while placed in a magnetic field of constant intensity. The following are the results:—With iron the total and temporary magnetisations both increase up to 260° C., above which the temporary magnetisation falls off rapidly, but the permanent slowly. In steel the total magnetisation is also a maximum at 260° C., but the permanent magnetisation attains its maximum about 240° C. The magnetisation of a steel bar magnetised while cold is diminished by heating, whilst that of a bar magnetised while hot is diminished by cooling. This result appears to be important, as it would follow that a magnet has its permanent maximum power at that temperature at which it was magnetised. With nickel the total magnetisation increases up to 240°, and diminishes above 280° so rapidly as to be zero at 330°. But if magnetised at 280°, the magnetic moment during the subsequent cooling first increases, then diminishes slightly, but still remains greater than at the temperature at which it was magnetised. Cobalt behaves like steel.

M. HESEHUS publishes in the last volume of the *Journal* of the Russian Chemical and Physical Society an interesting paper on his researches on "residual elasticity" (a rather difficult term to translate), the *elastische Nachwirkung* of W. Weber. Without attempting to deal with the immense range of phenomena concerning permanent changes of shape of elastic bodies under the influence of small but continually acting forces, M. Hesehus has studied these changes in a few bodies, especially in lead and caoutchouc, and has made an attempt to bring these changes into connection with other physical phenomena. He comes to the conclusion that residual elasticity depends to a great extent upon the mass of the body, and its surface; that the elastic conductibility depends upon, and increases with, temperature; and that the laws of residual elasticity afford close analogies with those of heating and cooling of solid bodies, as well as with those of phosphorescence and of residual magnetism and electricity.

AT a meeting of the Russian Physical Society, M. Kraevitch made an interesting communication on the results of his researches on the elasticity of air. Rarified air does not obey the Boyle-Mariotte law, that is, in proportion as it becomes more rarified its elasticity diminishes more rapidly than its density, and becomes equal to zero, while the density has still a measurable value. M. Kraevitch observes that it would result from these experiments: (1) that the atmosphere of the earth is limited; and (2) that our weights of gases contain an error, as, however perfect the pneumatic machine, it cannot pump all air from a vessel, if this vessel is lower than the pneumatic machine, or the air is pumped from above. Prof. Mendeleeff, recognising the importance of these researches, advised M. Kraevitch to continue them on heavy gases.

IN a paper relating to recent studies of the Rhone glacier (read at last meeting of the Helvetic Society of Sciences), Prof. Forel formulates these four questions as, in his opinion, the most urgent for a theoretic knowledge of the phenomena of glaciers: (1) How and in what measure does the velocity of flow vary in different layers of the depth of the glacier? (2) How and in what proportion does the surface-velocity vary if the glacier increases or diminishes in thickness? (3) What is the temperature of the internal mass of the glacier? (4) What are the laws of periodic variations of different glaciers? (For this study it is desirable to know, in the case of each glacier, the epochs of commencement ot periods of elongation or shortening).

HERR HERTZ has recently measured with special apparatus, the pressure of saturating vapour of mercury at different temperatures, from 0° to 220° (*Wied. Ann.*, No. 10). His numbers are considerably smaller than those of Regnault; and with Herr Hagen's they agree only between 80° and 100° C., being greater below, and smaller above these limits. Between 0° and 40° he finds the elastic force of the vapour of mercury to vary from 0·00019 mm. to 0·0063 mm. It follows that at ordinary atmospheric temperatures it is less than $\frac{1}{1000}$ mm. This result is important in reference to barometers, machines, and Geissler tubes.

SIGNOR MARTINI has studied the sounds produced by outflow of water through a cylindrical hole in a metal disc at the bottom of a long glass tube filled with the liquid (*Atti del. R. Ist. Veneto*, 5 ser. t. viii. 1882). In such a case one does not hear a series of sounds of decreasing pitch, though the liquid charge continually shortens; but a certain number of distinct sounds. The sound is due, as Savart proved, to the vibrations of the liquid vein; and the author verified Savart's law, that the numbers of these are proportional to the liquid charge and inversely as the diameter of the hole. A pure sound of clear tonality is only got if the sound of the vein is one of those the liquid column can yield. The series of sounds from a liquid column of constant length is that of the harmonics of an open pipe. The air column above the liquid strengthens some of the sounds. The sound is quenched if the tube is kept from vibrating. These experiments afford a means of comparing the velocities of sounds in different liquids. One has only to find what lengths the columns must have to yield a particular sound (all air-bubbles must be expelled). The author has tried alcohol, sulphuric ether, and petroleum, and found numbers agreeing with those by other methods.

IT appears from recent experiments by Herr E. Wiedmann (*Wied. Ann.*, No. 12) that a number of water-containing salts, when heated, undergo chemical transposition even before fusion. He has, in this inquiry, found two new modifications of zinc-sulphate and magnesium-sulphate, and determined the changes of volume attending their formation. The general result, he points out, is of interest with reference (1) to determination of tension, inasmuch as it is necessary, first, to ascertain whether a given salt remains unaltered or not within the range of temperature considered; (2) to researches on heat of solution, &c., of a salt partly deprived of water by heating; it should be exactly determined in what form water and anhydride salt are combined.

CHEMICAL NOTES

A RECENT patent by Mr. Morris, of Uddingston, N.B., claims to have solved a problem which has long baffled the skill of technical chemists. By heating an intimate mixture of alumina and charcoal, in a current of carbon dioxide, Mr. Morris says that metallic aluminium is produced; the metal is purified from carbon and aluminium by fusion.

WHAT may perhaps be called the kinetic theory of chemical actions, the theory, namely, that the direction and the amount of any chemical change is conditioned not only by the affinities, but also by the masses of the reacting substances, by the temperature, pressure, and other physical circumstances—is being gradually accepted, and illustrated by experimental results. Thus Hammond (*Monatsheft für Chimie*, 3, 149) concludes, from experiments on the hydration of salts, that when a saline solution is gradually concentrated various hydrates are formed, but that the crystallisation of any one of these from the liquid depends on the relative quantities of the various hydrates, and on the temperature of the solution. Another example of the establishment of a state of equilibrium between antagonistic chemical systems is furnished by the recent observations of L. de Boisbaudran (*Compt. rend.*, 95, 18) on gallium protochloride. When gallium is dissolved in cold concentrated hydrochloric acid a

stable solution of the protochloride is obtained; but when water is added to the solution hydrogen is evolved and gallium perchloride is produced.

HERR SCHWARZ describes (in *Berichte der Deut. Chem. Ges.*, xv. 2505) three lecture experiments illustrative of the action of zinc on sulphur: 2 parts of fine zinc powder are carefully mixed with 1 part of flowers of sulphur, and the mixture is ignited by an ordinary match; combination occurs with evolution of much light. Vapour of carbon disulphide is passed over zinc powder, which is gently heated in a piece of glass tubing; zinc sulphide is produced, and a considerable quantity of carbon is separated. Sulphuretted hydrogen is passed through carbon disulphide, and the mixed gases are then conducted over hot zinc powder; zinc sulphide is produced, and a gas, which is passed through potash and collected in a small gas-holder; this gas burns with a slightly luminous flame, and explodes when mixed with air; it is marsh gas.

NILSON has prepared the rare metal thorium in considerable quantity, and determined its atomic weight to be 232·35, specific gravity about 11, and atomic volume about 21 (*Berichte*, xv. 2519).

M. MIKLUKHO-MACLAY ON NEW GUINEA

AMONG the queries that were submitted to M. Milukho-Maclay before his departure from Europe, was one of Karl von Baer, who advised the traveller to visit the Philippine Islands, and to bring home several skulls of the natives, in order to ascertain whether the primitive inhabitants of these islands are brachiocephalic, or not. During a five days' stay of the clipper *Izumrud* at Manila, M. Maclay visited the Mariveles mountains, and discovered there Negritos who lived in their *pondos*, or small huts made out of palm-tree leaves. Numerous measurements (favoured by the custom of the men shaving the back of the head) proved that they really are brachiocephalic, the index being no less than 87·5 to 90 Their size is altogether small; one woman, mother of two children, measured only 1·30 metre. Their faces proved to be very much like those of the Papuans of New Guinea, while their customs are much akin to those of the inhabitants of many Melanesian islands. For instance, when M. Maclay threw some remains of food in the fire, the Negritos immediately extinguished it, and asked him not to do so again. The same prejudice exists with regard to spitting in the fire (a very widely-spread prejudice, we may observe, as it exists also in Russia and Siberia). Another interesting custom of the Negritos is that everybody, before eating, must loudly shout out several times, an invitation to partake of his food, to all those who may be in proximity. This custom is very rigidly observed, and those who do not comply with it are punished, even by death.

In August, 1874, M. Miklukho-Maclay undertook a journey into the interior of the Malay peninsula, in order to settle the question as to the race of its inhabitants—the Orang-Sokays and the Orang-Semongs—about which question there existed a controversy between Messrs. Logan, Newbold, Crawford, and Waitz. M. Maclay went, therefore, from Singapore to Johore. The Maharajah of Johore received him very kindly, and gave him the necessary men for the journey, as well as orders to his subjects to help him in every way during his journey. In exchange, M. Maclay was bound to prepare a map of the dominions of the Maharajah. The Russian traveller crossed the Johore country twice—from west to east and from north to south. The journey was very difficult, on account of the rainy season; the rivers and streams had inundated the country, even the woods, and the party had to walk in water that reached to the knees, and often to the breasts of the oxen. For seventeen consecutive days they were quite wet, as well as their baggage. Reaching thus the mouth of the Moar river, M. Maclay journeyed up this river in a flat boat, passing by Malayan villages, reached its confluence with the Pallon, and went up the last river. At its sources he discovered in the woods the first hats of the so-called "orang-utangs." This name is given by the Malayans, not to the ape, *Pithecus satyrus*—they never call apes by the name of "orang," but to "forest-men." "Orang" signifies "man," and "utang" a forest. Therefore the Malayans say *orang-bukit* (men of the hills), *orang-ulu* (men at the source of a river), *orang-dalah*, *orang-laut* (men of the interior of the sea-shore), and so on. However, the name *orang-utang* could be applied also to a Malay who stays in the woods, but still it is used to designate a tribe of Malays crossed in various degrees with Papuans, as also with Melanesians.

[1] Continued from p. 138.

Though the different tribes M. Maclay met with during his journeys in Johore differ from one another, still none of them are Melanesians. They forget their primitive language, and adopt that of the Malays. M. Maclay presumes that formerly they had several languages, and were divided into several tribes; some difference still remains in their customs. They are at a very low stage of human culture. They wander in the woods, and only occasionally come to stay in their miserable huts. The Malays distinguish two different tribes of orang-outangs: the orang-outang-dina (or tame, who are in intercourse with them), and the orang-outang-liar, quite nomadic. These last use a weapon, *sumpitan*, which deserves to be mentioned. It consists of a hollow bamboo cylinder, two metres long and two or three centimetres wide, through which they blow against their enemies very light poisoned arrows, as large as knitting-needles. The end of these arrows breaks, and remains in the wound. The Malays say that the slightest scratch of such an arrow kills a man in ten or fifteen minutes. M. Maclay purchased quantities of their poison, which proved always to be made of a condensed infusion of the bark of the Javan tree, *Antiaris toxicoria*, or Upas, to which different tribes add other poisons, such as the poison of snakes, of poisonous kinds of strychnis, &c. A small prick of a poisoned arrow kills a dog or a cat, the death being accompanied by tetanus or not, according to the secondary poisons added to the chief one. The Orang-outangs are rapidly disappearing since they were driven by Chinese and Malayans from the sea-shore to the woods of the interior. Besides, the Chinese and Malays purchase their best-looking and healthier girls, leaving them the feeblest, who leave but a weak progeny. The children from the Malays and Orang-outang girls are far more like the former than the latter.

After having crossed the Johore country from the mouth of the Moar River to the entrance of the Indan into the Chinese Sea, that is, from west to east, M. Maclay crossed the same country from north to south, that is from the Indan to the Selat-tebran Strait, which separates Singapore Island from the mainland. He contracted, of course, a strong fever during this journey, fifty days long, and went to Bangkok. There he happened to receive from the King of Siam a letter to his vassals of the Malay peninsula, enjoining them to help M. Maclay during his further travels on the peninsula. Provided with this recommendation, the Russian traveller undertook a most adventurous journey, namely, to walk from Johore to Siam. It was considered by all his acquaintances as quite impossible, but he accomplished it, as the small rulers of the southern part of the Malay peninsula did not venture to stop him on his way, and preferred, each of them, to despatch him to the next ruler. In this way M. Maclay reached Siam, after a journey that lasted for 176 days.

In the mountains at the sources of the Pakkan River, M. Maclay finally met with undoubtedly pure Melanesians, Orang-Sakays, and made on them a few anthropological measurements. They differ as much from the Malayans, as the Malayans differ from the Papuans, and are like the Negritos of Luzon. The height of the men varies between 1·46 and 1·62 metres, and that of the women from 1·35 to 1·48; the skull is nearly brachiocephalic, that is, the widest is between 74 to 82 for men, 75 to 84 for women, and 74 to 81 for children. The diameter of the curls of the hairs is the same as with the Papuans, that is, from 2 to 4 millimetres. The colour of skin is between the numbers 28 to 42, and 21 to 46 of the table of Broca. The *plica semilunaris*, or the so-called *palabra tertia*, is more developed than with other races; its width reaches sometimes 5 and 5·5 millimetres, instead of the 1·5 to 2 millimetres of the Caucasian race. Finally the Orang-sakays have also a fold of the skin at the interior corner of the eye which is known, when pathologically developed, under the name of *Epicanthus*. Like the Orang-utangs they are disappearing; they nomadize in forests, stopping at a few places to mass collections of camphor and caoutchouc tree, of rotang and elephant bone, which they exchange with Malays for tobacco, salt, iron knives, and various rugs which they use for their dress. The dress of the men consists of a girdle, a part of which covers the *perinacum*: the women have also a girdle of rotang, to which two rugs are adjusted. The women are tattooed by lines and round spots. The Orang-sakays, like other Melanesians, put in the partition of the nose the *hayanmsh*, that is, a long stick of bamboo, or a spike of the *Hystria*.